

WORKING PAPER
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

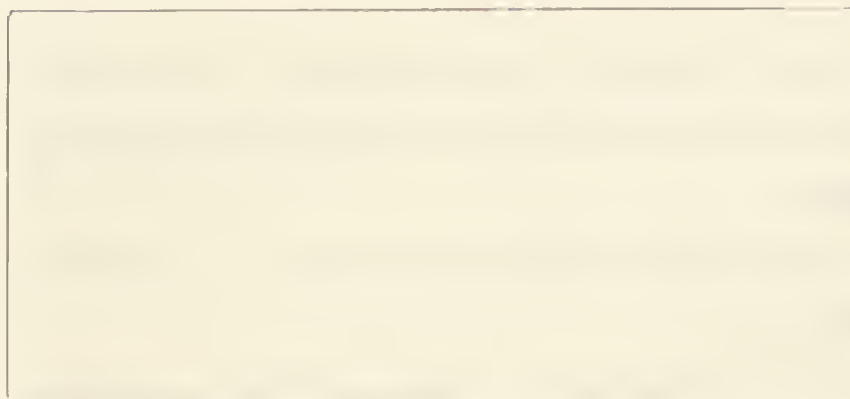
THE IMPACT OF FINAL OFFER ARBITRATION
IN MASSACHUSETTS: AN ANALYSIS OF POLICE
AND FIREFIGHTER COLLECTIVE BARGAINING

David B. Lipsky Thomas A. Barocci W. William Suojanen

WP 941-77

May 1977

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY
50 MEMORIAL DRIVE
CAMBRIDGE, MASSACHUSETTS 02139



THE IMPACT OF FINAL OFFER ARBITRATION
IN MASSACHUSETTS: AN ANALYSIS OF POLICE
AND FIREFIGHTER COLLECTIVE BARGAINING

David B. Lipsky Thomas A. Barocci W. William Suojanen

WP 941-77

May 1977

TABLE OF CONTENTS

	Page
Preface and Acknowledgements	iii
I. Summary of the Study	1
II. Introduction	5
Appendix to Section II. Summary of the Massachusetts Final-Offer Arbitration Law for Police and Firefighters	14
III. Impasse Experience in Massachusetts, 1972-1977	18
IV. Salary Levels and Changes for Massachusetts' Police and Firefighters, 1973-77	28
V. Multivariate Analysis of the Determinants of the Change in the Salary Levels of Police and Firefighters	41
VI. Interpretations and Conclusions	57
Appendix 2. Summary of Data Sources Used in the Analysis	61

Preface and Acknowledgements

Over the last five months the authors have been carrying on research relating to the process and impact of the Massachusetts statutes regulating the collective negotiations of police and firefighter bargaining units within the state. Although we have not yet completed our full analysis, the immediacy of the situation mandated that we assemble this abbreviated report. We have made an attempt to include in this report the findings of our study most closely related to the issues currently under debate in the state legislature.

The report is divided into six sections. Section I is a summary of the major findings and conclusions. Section II offers an introduction to the problem and a brief review of the legislative history of this issue in Massachusetts. In Section III the impasse experience of police, fire and teacher collective bargaining units is examined, while Section IV reviews salary levels and changes over the study period. Section V presents a discussion of a multivariate analysis on the determinants of salary change for each safety employee group and the final section offers interpretations and conclusions of the study. The one appendix offers a brief overview of the data sources and collection procedures.

Funds for this study were provided by the Sloan School of Management, Massachusetts Institute of Technology. We would particularly like to thank Associate Dean Abraham J. Siegel for his support, advice, and encouragement. We would also like to thank Helaine Knickerbocker, Chairman of the Massachusetts Board of Conciliation and Arbitration, and the staff of the Board for their cooperation. In addition, various employee and employer representatives in Massachusetts were helpful. In particular we would like to thank T. Dustin

Aylward of the Professional Firefighter Association of Massachusetts, Mr. Richard Sullivan, International Brotherhood of Police Officers, Mr. Paul Somers, Massachusetts League of Cities and Towns, Mr. James Cooper, Massachusetts Labor Relations Commission, Mr. Alexander MacMillan, former director of the Massachusetts Labor Relations Commission, Mr. Lawrence Holden, former director of the Board of Conciliation and Arbitration, Mr. Michael Gilman, Holtz and Drachman, Mr. George Sacco, Attorney for the Massachusetts Police Association, Mr. Nick Russos, Commissioner of Labor and Industries and the staff at the Massachusetts Taxpayers Foundation. Finally, we would like to thank Ethan Jacks, Peggy Taylor, Richard Fletcher, Bonnie Burate, and Ed Gonzales for their research assistance. Paul Cornoyer provided us with excellent computer assistance. We wish to emphasize, however, that findings, analysis, and conclusions are solely the responsibility of the authors and do not necessarily represent the views or opinions of individuals or organizations that lent their cooperation to the study.

David B. Lipsky
Associate Professor
Cornell University, on leave to M.I.T.

Thomas A. Barocci
Assistant Professor
Sloan School of Management, M.I.T.

with William Suojanen
Assistant Professor
Northeastern University and
Ph.D. candidate, M.I.T.

I. Summary of the Study

In 1973 Massachusetts passed a statute providing for final-offer arbitration as the last step in the impasse procedure in disputes involving police officers and firefighters (Section 4 of Chapter 1078 of the Acts of 1973). The law took effect on July 1, 1974 and is due to expire on June 30, 1977.

The principal purpose of this study was to assess the economic impact of the final-offer statute. Specifically, we sought to determine whether the statute has had a discernible impact on the salaries of patrolmen, police sergeants, firefighters, and fire lieutenants. A secondary objective of the study was to determine what, if any, effect the statute has had on the collective bargaining process involving public safety employees and their municipal employers in the Commonwealth.

Data were collected on all impasses occurring in police and fire disputes over the period 1972-77. In addition, an effort was made to survey as many police and fire contracts in force over the period 1973-77 in order to determine the level of salaries paid to the four employee groups under study. Finally, data were also collected on other economic and environmental factors that are generally thought to have an influence on the level and movement of public safety salaries.

Analysis of the data allows us to answer the following questions concerning the impact of the final-offer statute. First, did the final-offer statute affect the incidence of police and fire bargaining impasses in the state and the stage of settlement (no impasse, mediation, fact-finding,

arbitration) in such disputes? Second, is there a significant difference in police and salary settlements by stage of settlement for the period under study? Third, did police and fire employees win salary increases that were significantly different from the increases gained by police and fire employees in other states of the Northeast region of the United States? Fourth, did final-offer awards result in higher police and fire salary settlements than one would have expected in the absence of the statute? Fifth, were there other observable economic and environmental factors that had a significant influence on the movement of police and fire salaries in Massachusetts?

Our findings can be briefly summarized:

1. The number of police and fire impasses increased significantly after the passage of the final-offer statute. In the three-year period preceding passage of the law, there were 168 police and fire impasses; in the first two and one-half years following the law's passage there were 355 police and fire impasses. In addition, the effectiveness of mediation in achieving settlements in public safety impasses seemed to decline after the law was passed. To what extent these changes in the process can be attributed to a "chilling effect" created, by the law itself, to the parties' desire to experiment with a new technique of dispute settlement, or to the tougher economic climate that prevailed after 1974 is problematical.

2. In general we find no significant relationship between the stage of settlement in police and fire bargaining (either before or after the passage of the final-offer statute) and the rate of change of police and fire

salaries. Salary changes resulting from arbitration awards were not significantly different from salary changes achieved without impasse, in mediation, or in fact-finding. Furthermore, we argue that it is unlikely that arbitrated salary awards set a pattern that influenced the level of salary settlements in non-arbitrated cases.

3. Examination of police and fire salary data for cities with over 100,000 population in the Northeast region of the United States, compiled by the U.S. Department of Labor, reveals that Massachusetts public safety employees were able to gain larger salary increases than comparable employees elsewhere in the region in 1975, but had gained smaller increases in 1974. On net, the salaries of police and fire employees in the Commonwealth have increased at about the same rate as the salaries of comparable groups elsewhere in the Northeast.

4. Statistical analysis of the relation between police and fire salary movements and stage of settlement, controlling for other factors that might influence salary changes, demonstrates that the salaries of police and firefighters are not significantly different from what one would have expected in the absence of the final-offer statute. The one exception to this finding involves fire lieutenants' salary settlements in 1975-76; arbitration is associated with salary changes for this group that are significantly higher than one would otherwise have expected. Fire lieutenants and police sergeants also appear to achieve higher settlements in mediation under the final-offer statute than one would otherwise have expected.

5. In most cases, the other economic and environmental factors that we expected to be related to police and fire salary changes had no influence or a weak influence at best. Such factors as state aid, the full value of assessments per capita, and the community's unemployment rate had a negligible influence on salary changes. There is, on the other hand, some evidence that a "catch-up" effect was operative in police and fire settlements for the years under study. It appears that in some cases larger salary gains were won by public safety employees who were relatively low paid compared to public safety employees in other towns and cities. Although this effect may be associated with the use of collective bargaining, it is not associated with the use of impasse procedures, including arbitration, in police and fire units.

In sum, our study does not lend support to the notion that the addition of final-offer arbitration to the array of impasse procedures available to Massachusetts' police officers and firefighters had a significantly positive effect on the salary levels they were able to achieve in negotiations.

II. Introduction

Collective bargaining in the public sector experienced a phenomenal period of growth over the past 15 years. It is estimated that currently better than 30 percent of the 12.3 million workers employed by state and local governments are members of labor unions or professional and civil service associations. About one million employees of state and local governments are police officers and firefighters. Rates of unionization among police and fire employees are high, compared to other public sector employee groups. The firefighters are the most heavily organized nationwide: it is estimated that about 77 percent are covered by union contract. About 56 percent of the nation's police officers are covered by a collective bargaining agreement. In Massachusetts, almost all police officers and firefighters are reorganized.

In the 1960's policy issues centered on whether public sector employees had the right to organize and to bargain over the terms and conditions of their employment. By 1976, 42 states had passed laws dealing with the organizational and bargaining rights of firefighters; 34 states had statutes covering police officers. Not all of these statutes actually provide bargaining rights for public safety employees. The sole purpose of some of them is to ban strikes by police officers and firefighters. Other states have granted public safety employees the right to "meet and confer" with their public employers, but not the right to bargain. In states without statutes, labor relations for police and fire employees are governed by Executive Orders issued by the governor, decisions handed down by courts and agencies, municipal ordinances, or opinions issued by the state's Attorney General.

In all but two states (Hawaii and Montana) there is an absolute ban on the right of police and firefighters to strike. As a substitute for the right to strike, most state statutes have established impasse procedures to assert in the resolution of disputes over salaries and working conditions. In several jurisdictions, binding arbitration has been adopted as the method of resolving bargaining impasses. The list of states using arbitration includes New York (statute passed in 1974), Michigan (1969), Pennsylvania (1970), Minnesota (1971), Wisconsin (1971), Nevada (1969), Connecticut (197), and Iowa (1974). In most of these states, arbitration is restricted to police and fire disputes, while the last impasse step for other employee groups is usually fact-finding. Selected public employee groups are granted a limited right to strike in nine jurisdictions.

In addition to Massachusetts, Connecticut, Iowa, Michigan and Wisconsin now use some form of final-offer arbitration to resolve police and fire disputes. Massachusetts and Wisconsin practice a "pure" form of final-offer arbitration whereby each party must submit one final package incorporating all outstanding issues and the arbitrator selects what he considers to be the more suitable package. Connecticut, Iowa, and Michigan adopted a variant of the concept allowing arbitrators to consider each outstanding issue separately and select from one or the other side's final positions on an issue-by-issue basis. Michigan further limits final-offer arbitration to economic issues only.

In Massachusetts, there are now essentially three stages in the impasse procedure for police and fire employees -- mediation, fact-finding, and arbitration. It will be useful to set out a concise definition and description of

these stages:

Mediation: If the parties in collective bargaining are unable to agree on a new contract through negotiations, either side has the right to assert an impasse and ask the Massachusetts Board of Conciliation and Arbitration to assign a mediator to the case. A mediator assists the parties in reaching settlement, but has no authority to impose contract terms on them. A mediator can offer suggestions and advice and make recommendations. He can solicit confidential information from each side concerning concessions that might be made to achieve a settlement. On the basis of such information, a mediator may then be able to discern the shape of an eventual agreement and tactfully persuade the parties to work toward that end. A mediator's "authority" is ultimately based on his expertise in labor relations and his ability to work harmoniously with the members of the bargaining teams. In Massachusetts, the mediation of all public safety impasses is handled by an experienced, permanent staff of professionals employed by the Board of Conciliation and Arbitration.

Fact-Finding: If the parties are unable to achieve a settlement of their dispute in mediation, they have the right to request a fact-finder. The fact-finder assigned to a case may hold a hearing at which both parties have the opportunity to present the "facts" of a dispute, offer testimony and evidence, and make arguments. The fact-finder then can write a report in which he makes his recommendations to settle the impasse. The fact-finding report is usually made public but the parties are never bound to accept its recommendation. Either side to a dispute has the right to reject the recommendations in whole or in part. Often fact-finders will attempt to mediate a dispute, either before

or after a hearing is held. No reports need be issued in cases where the fact-finder has successfully mediated the dispute or where the parties have, by other means, resolved their impasse during the fact-finding stage. In Massachusetts, fact-finders are usually appointed by the Board of Conciliation and Arbitration on an ad hoc basis from a panel of experienced neutrals. The parties do have the right, however, to select their fact-finder by alternative means.

Arbitration: If either party to an impasse rejects the fact-finder's report, and if the parties are unable to reach agreement by other means, a petition to initiate final-offer arbitration may be filed by a certified employee organization with the Board of Conciliation and Arbitration. Such a petition can be filed if the parties remain at impasse over any terms of a collective bargaining agreement for more than 30 days after a fact-finder's report has been published. Before the parties can proceed to arbitration the Board must determine that (1) the sections of the law pertaining to fact-finding have been complied with in good faith by the employee organization; (2) 30 days have elapsed since the publication of the fact-finder's report, (3) "the proceedings for the prevention of any prohibited practices have been exhausted, provided that any such complaints have been filed with the [Massachusetts Labor Relations Commission] prior to the date of the fact-finder's report," and (4) an impasse exists. If these conditions are met, the Board notifies the parties, who then have 14 days to select a three-member arbitration panel and notify the Board of their selections. The panel consists of one representative designated by the employer and one designated by the employee organization. These two members then select a third, impartial member who serves as chairman of the panel. The arbitration panel schedules a hearing,

at which the parties have full and equal opportunity to present records, evidence and arguments bearing on the impasse. They may call witnesses and they are often, but not always, represented by counsel. At the conclusion of the hearing, "each party shall promptly and simultaneously submit to the arbitration panel... and to each other a written statement of its last best offer on each issue in dispute." Following the submission of final offers, each party has the right to make an oral argument or file a brief with the panel. The panel is instructed to conclude its hearings within 40 days of their commencement. Within 10 days of the conclusion of the hearing, a majority of the panel must choose either the employer's or the union's last offer. The selection of one offer is final and binding upon the parties and "upon the appropriate legislative body." The panel may issue a written opinion in support of its selection on one of the final offers, and the panel's award and opinions are then made available to the public. The parties share equally the fees and expenses of the panel chairman. It should be added that the Chairman of the arbitration panel, prior to the issue of an award, can, at his own discretion, remand a dispute to the parties for further bargaining. If remanded, the chairman may serve as a mediator to assist the parties in achieving settlement. In practice even if a dispute is not formally remanded, the chairman has in several cases been able to affect a settlement by informal means. There have also been cases where the parties have been able to achieve settlement on their own during the arbitration phase. (The incidence of mediated or negotiated settlements achieved either in fact-finding as in arbitration is presented below.)

Final-offer arbitration as practiced in Massachusetts can be distinguished from conventional arbitration. Under conventional arbitration the arbitrator fashions his award from the various issues submitted to him for resolution.

Usually his award is a compromise solution that does not hold entirely with either the position of the union or the position of the employer. Often an arbitration in "conventional" cases will "split the difference" between the final positions of the parties. The parties, knowing that the arbitrator is likely to fashion a compromise settlement, thus have an incentive to withhold their true positions in arbitration in the hope that the arbitrator's compromise solution will approximate the party's true objectives in bargaining. Accordingly, the parties subject to conventional arbitration withhold concessions during negotiations and present extreme positions to the arbitrator. Consequently, it is argued that conventional arbitration has a "chilling effect" on negotiations and causes the parties to become more intransigent in their positions than they otherwise would be.

Final-offer arbitration is designed -- at least in theory -- to overcome these defects. If the parties know that the arbitrator will be forced to choose one package or another, so the argument goes, they will no longer have an incentive to withhold concessions during negotiations. If they do adopt unyielding positions, they run the risk of losing the arbitration case to their bargaining opponent. Final-offer arbitration is based on the expectation that the arbitrator will be able to discern the more "reasonable" of two offers and will make his selection accordingly and, further, that a party will thus maneuver to assume a stance that will appear more reasonable than its opponent's to the arbitrator. If these assumptions about the dynamics of the process are correct, then final-offer arbitration ought to decrease reliance on outside neutrals and should lead to more voluntarily negotiated agreements.

In theory, then, there should be no "chilling effect" under final-offer arbitration. Rather, just the opposite should occur -- the parties should have added incentive to compromise, concede, and reach agreement on their own. The technique has been criticized, however, on several grounds. First, some negotiators, particularly those that are not especially sophisticated about the process, may not perceive the risk involved in using final-offer arbitration. If the risk of losing is not perceived, then the presumed incentive to concede and compromise will not be present. Second, negotiators may accurately perceive the risk, but may be so convinced that their position in bargaining is correct and just that they nevertheless do not concede or modify their stance. Third, some negotiators may realize that they need somehow to move to a "reasonable" position, but calculate that the risk of losing in arbitration will not be substantially affected if one item in their final offer package is, by some definition, "unreasonable." Thus, arbitrators can be placed in the position of choosing between two final offers, each of which contains one or more "outrageous" demands. In sum, final-offer arbitration does not guarantee that awards made by arbitrators will necessarily meet tests of fairness and equity.

Final-offer arbitration in Massachusetts has been in effect since July 1, 1974. Since the enactment of the law there has been a continuous debate on its efficacy and much speculation concerning the influence of the law on the process and outcomes of police and fire bargaining. Critics of the law say that it clearly favors the unions, stifles the bargaining process, and results in inflationary wage settlements. They point to the fact that unions have won

approximately two-thirds of the cases going to arbitration.

Some of the critics are particularly sensitive to the fact that municipalities are required to fund an arbitration award whereas the funding of settlements reached through negotiations, mediation, or fact-finding is put to a vote. As a result, they argue, cities and towns are forced to pay inflated wages. Furthermore, it is believed that the incentive for meaningful pre-impasse bargaining, which final-offer arbitration is supposed to provide, is severely undermined because of the fact that arbitrated settlements are guaranteed funding while negotiated settlements are not.

On the other hand, supporters of final-offer arbitration deny that it results in inflationary outcomes. They point out that comparable wage increases are met in every sector of the economy and so it is unrealistic to think that municipal governments would be immune to such a trend. Those who advocate final-offer arbitration believe that its effectiveness in preventing strikes and facilitating settlements is evidenced by the fact that there have been no work stoppages by police or fire ^{employees} in Massachusetts during what has been a very trying economic period. They also argue that the proportion of union "victories" in arbitration cannot be used to judge the fairness of the law, since such a "box score" does not take account of the quality of the offers made by the parties to the arbitrator.

Suffice to say that the supporters and critics of the law are equally adamant, but at the same time have not presented evidence on the impact of law which would allow for a definite conclusion. There is an immediacy to the resolution of the debate as the law will expire at the end of June, 1977,

unless the legislature votes to extend it.

The purpose of this study is to shed some light on the impact of the law on both the process and outcomes of bargaining. The bulk of our attention is directed at an assessment of the economic impacts of the law (measured in this analysis as the absolute level and change in salaries) as this is the issue that has generated the greatest amount of debate. Moreover, attention is given to the analysis of changes in impasse experience of the parties over the last six years.

Appendix to Section II.

Summary of the Massachusetts Final-Offer Arbitration Law for Police and Firefighters

The legislative history of final-offer arbitration in Massachusetts is a fascinating interplay of political forces which culminated in the addition to Chapter 150E, the comprehensive public employee bargaining law, of a provision for binding arbitration as a last step in police and firefighters collective bargaining disputes. Before discussing the details of the provision, it is useful to look at the legal context in which it occurs.

The first piece of legislation to cover bargaining in the public sector was Chapter 149, section 178D, passed in 1958, granting public employees the right to join unions and to "present proposals" to public employers. In 1964 this chapter was amended such that state employees could now bargain with respect to working conditions, but not wages. A year later additional provisions were added to allow all municipal employees the right to bargain about wages, hours, and terms and conditions of employment.

Even this brief description conveys the patchwork structure of laws relating to public sector bargaining. In 1969 the Mendonca Commission, a group representing unions, cities and towns and the state legislature, was established to study the current system and attempt to formulate a comprehensive piece of legislation. The Commission served as a forum for discussing various new proposals including final-offer arbitration.

During the period from 1970-1973 there was a great deal of attention nationally on the problem of interest dispute resolution in vital public services, especially police and fire. The International Brotherhood of Professional Firefighters had urged its state associates to lobby for compulsory

binding arbitration. Indeed, the Professional Firefighters of Massachusetts, the union representing most firefighters in the state, had sponsored a bill to allow binding arbitration in their collective bargaining, which was passed by the legislature, but vetoed by the Governor. Furthermore, other states were experimenting with impasse resolution procedures which involved some type of final-offer as a last step. Several members of the Mendonca Commission were especially interested in this concept and solicited various expert opinions on the subject.

The combination of continuing pressure from the Firefighter's union and a consensus on the Commission's part that the time was right for a new approach prompted the committee to recommend as part of its Comprehensive Package, a provision for compulsory final-offer, binding arbitration for interest disputes arising out of collective bargaining with police and firefighters. Unlike the rest of the new law, Chapter 150E, the final-offer provision was slated to expire on July 1st, 1977.

It is important to realize that final-offer arbitration in the Massachusetts system is the last step of the impasse procedure. The parties must pass through negotiation, impasse certification, mediation, and fact-finding each of which (except negotiation) must occur within a specified time frame. If after going through these steps an impasse still exists, the employee's organization must petition the Board of Conciliation and Arbitration to initiate final-offer arbitration. Before initiating this step the Board will determine if the four following preconditions exist:

- 1) all preceding steps have been exhausted, 2) 30 days have elapsed since the publication of the fact-finders report, 3) an impasse continues to exist,

4) any complaints of prohibited practices filed prior to the fact-finders report before the Labor Relations Commission have been adjudicated.

If the conditions are met, the Board will appoint, if necessary, a three-man arbitration panel. The panel has 40 days from the commencement of the hearing to take all necessary evidence and conclude the proceedings. If the impasse still exists at the end of the hearing, each party submits its final offer on all issues still unsettled. Prior to this the Chairman of the panel has the authority to remand the dispute for further bargaining, up to three weeks, if he/she feels the parties are close to settlement.

In evaluating the final offers, the panel must consider the following factors:

1. The financial ability of the municipality to meet costs.
2. The interests and welfare of the public.
3. The hazards of employment; physical, educational and mental qualifications; job training; and skills involved.
4. A comparison of wages, hours, and conditions of employment of the employees involved in the arbitration proceedings with the wages, hours, and conditions of employment of other employees performing similar services and with other employees generally in public and private employment in comparable communities.
5. The decisions and recommendations of the fact-finder.
6. The average consumer prices for goods and services, commonly known as the cost of living.
7. The overall compensation presently received by the employees, including direct wages and fringe benefits.
8. Changes in any of the foregoing circumstances during the pendency of the arbitration proceedings.
9. Such other factors, not confined to the foregoing, which are normally or traditionally taken into consideration in the determination of wages, hours, and conditions of employment

through voluntary collective bargaining, mediation, fact-finding, arbitration, or otherwise between the parties, in the public service or in private employment.

10. The stipulation of the parties.

Finally, the panel votes on which package to accept, in total. The terms become binding on the parties.

III. Impasse Experience in Massachusetts, 1972-1977

Data gathered from the files and records of the Massachusetts Board of Conciliation and Arbitration allow us to trace the use of impasse procedures in police and fire negotiations from fiscal year 1972 through December 31 (1976) of fiscal year 1977. Information was also gathered on the incidence of impasse in teacher negotiations in order to allow some comparisons to be made between the use of impasse procedures with and without final-offer arbitration as the final step.

Table III.1 shows that for the five and one-half years covered by our data there were a total of 1,001 impasses in police, fire, and teacher negotiations. Of these, 305 (30.5%) involved police units, 218 (21.8%) involved fire units, and 474 (47.4%) involved teacher units. In an additional four cases, a combined police and fire unit went to impasse. When these data are broken down into two periods — encompassing the three fiscal years preceding the date that Chapter 1078 became law (July 1, 1974) and the other the two and one-half years that elapsed from the date of the new law to December 31, 1976 — the following becomes apparent:

- (1) The number of impasses increased for these three types of bargaining units from 371 in the pre-law period to 630 in the post-law period. This is an increase of nearly 70 percent.
- (2) Most of this increase is accounted for by a higher incidence of impasse in police and fire negotiations. The highest percentage increase in impasses occurred in firefighter bargaining; in the pre-law period there were 61 impasses, while in the post-law period there were 157 impasses, an increase of 157 percent.

TABLE III.1

A. IMPASSES IN POLICE, FIRE, AND TEACHER DISPUTES, FY 1972—FY 1977 (Dec.31)

	<u>No.</u>	<u>Percent</u>
Police	305	30.5%
Firefighters	218	21.8%
Teachers	474	47.4%
Police & Fire (combined units)	4	0.4%
	<hr/>	<hr/>
TOTAL	1,001	100.0%

B. IMPASSES IN POLICE, FIRE, AND TEACHER DISPUTES, FY 1972—FY 1974

	<u>No.</u>	<u>Percent</u>
Police	107	28.8%
Firefighters	61	16.4%
Teachers	202	54.4%
Police & Fire (combined unit)	1	0.3%
	<hr/>	<hr/>
TOTAL	371	100.0%

C. IMPASSES IN POLICE, FIRE, AND TEACHER DISPUTES, FY 1975—FY 1977 (Dec. 31)

	<u>No.</u>	<u>Percent</u>
Police	198	31.4%
Firefighters	157	24.9%
Teachers	272	43.2%
Police & Fire (combined units)	3	0.5%
	<hr/>	<hr/>
TOTAL	630	100.0%

Police impasses increased from 107 in the pre-law period to 198 in the post-law period, an increase of 85 percent.

Teacher negotiations - again, not subject to final-offer arbitration - resulted in impasses in 202 cases in the pre-law period and 272 cases in the post-law period, an increase of 33 percent.

Thus, of the 371 impasses of police, fire, and teachers coming to the Board of Conciliation and Arbitration in 1972-74, 45 percent were police and fire cases, while of the 630 impasses in the 1975-77 period, 57 percent were police and fire cases.

Since final-offer arbitration is intended to decrease reliance on third-parties in collective negotiations, these data may be viewed as running counter to the intention of the law. In order to assess accurately the presence of a "chilling effect," however, it is necessary to know how many police and fire units negotiated in any given year. Paul C. Somers, Director, Personnel/Labor Relations, Massachusetts League of Cities and Towns, has made such estimates for the period FY 1970—FY 1976. His data allow an estimate to be made of the proportions of police and fire negotiations that result in impasse. Table III.2 below shows that the proportion of impasses in the pre-law period went from 19.2 percent in 1973 to 28.1 percent in 1974. In the first year of the final-offer law, however, the proportion of impasses increased significantly to 53.6 percent. In the second year of the law, the proportion decreased to 42.1 percent.

TABLE III.2

The Proportion of Police and Fire
Negotiations Resulting in Impasse

FY 1972--FY 1976

	<u>Police and Fire Negotiations</u>	<u>Impasses</u>	<u>Proportion Resulting in Impasse</u>
1972	203	39	19.2%
1973	237	60	25.3%
1974	249	70	28.1%
1975	267	143	53.6%
1976	281	121	42.1%

Is this evidence of a "chilling effect" resulting from the availability of final-offer arbitration? Caution must be exercised in drawing such a conclusion. Clearly, many factors, in addition to the presence or absence of arbitration in the impasse procedures, determine whether the parties will declare impasse. The environment of bargaining was different in 1975-76 than it had been in 1972-74. First, cities and towns in the Commonwealth operated under greater fiscal constraints in 1975-76 than they had in the earlier period. The recession that began in late 1974 hit Massachusetts particularly hard and no doubt affected the revenues available to cities and towns for all purposes, including public safety salaries and benefits. Second, inflation, as measured by changes in the Consumer Price Index, reached 12.2 percent in 1974 and, despite the recession, continued at 7 percent in 1975. By contrast the CPI increased by just 3.4 percent in 1971-72. Third, wage settlements in 1971-73 were affected by constraints imposed by the federal government's program of wage and price controls under the Economic Stabilization Act. Phase II of the controls program, for example, imposed a guideline of 5.5 percent on salary increases in 1972-73. When controls were removed, many unions felt compelled to bargain for "catch-up" wages. The combination of these circumstances insured that negotiated settlements would be more difficult to achieve in 1975 and 1976 than they had been in the early 1970s. Accordingly, one would have expected the incidence of impasses to increase in the later period even if there had not been a change in the law.

In addition, it might be expected that the introduction of a new dispute settlement technique would arouse the curiosity of negotiators. It would be natural to expect that some negotiators would want to "test the waters" to discover just how the new - and still rather novel - technique of final-offer arbitration operated in practice. Expectations about the efficacy of the new

technique might have been unrealistic at first, leading to a greater reliance on the impasse procedures. When the parties' curiosity was satisfied, reliance on the procedures could be expected to decline. Undoubtedly some parties were not sufficiently educated in the way the law operated, and were therefore not aware of the "risk factor" inherent in the final-offer technique. For some negotiators, then, use of the law in the first year or two of its existence constituted a learning experience, which is likely to be followed by a return to more timeworn, less risky methods of achieving settlement. The fact that there appears to be some decrease in the number of police and fire impasses, and particularly in the use of final-offer arbitration, in fiscal 1977 provides partial support for these propositions.

It can also be argued that the proper measure of a "chilling effect" is not the total number of impasses occurring in a particular year, but the number of cases actually ending with a final-offer award. Our evidence indicates that 37 final-offer awards were issued in the first two and one-half years of the law. Of that number:

8 cases resulted from impasses declared in the last half of fiscal 1974, before the final-offer law was passed

23 cases resulted from impasses declared in fiscal 1975

5 cases resulted from impasses declared in fiscal 1976

1 case resulted from an impasse declared during the first six months of fiscal 1977.

These numbers clearly indicate a sharp drop in the number of final-offer cases after 1975. Even in 1975 less than 9 percent of police and fire units involved in negotiations resolved their disputes through arbitration. In fiscal 1975, the proportion fell to less than 2 percent. In other words, over the first two years of the law 95 percent of those cities and towns that negotiated new police and fire contracts were able to achieve agreement without resorting to arbitration. (It is interesting to note that under the final-offer

statute in Wisconsin, 12 percent of police and fire units utilized arbitration in the first years of the law.)

It is too early to conclude that the sharp drop in the use of final-offer arbitration after fiscal 1975 establishes a trend. The evidence for fiscal 1977 is necessarily incomplete. At the time our data were collected only one public safety case originating out of the current year's negotiations had ended with arbitration. As of this writing, we understand that at least two more cases have also ended in arbitration. But it should be understood, first, that most police and fire contracts that expire with fiscal 1977 expire on June 30, 1977 and, second, that knowledgeable observers believe that many police and fire negotiators have not pressed forward in the impasse procedures but rather are waiting to see whether the Massachusetts legislature and the Governor will decide to extend the law.

Another indication of how the final-offer statute has affected the negotiating process in police and fire units can be obtained by examining the stage at which police and fire settlements were achieved. Table III.3 provides information on stage of settlement for the pre-law period (1972-74) and for the post-law period (1975-77). It is clear from the data in this table that the relative proportion of cases settled through mediation declined in the post-law period. About 60 percent of public safety impasses were resolved in mediation in 1972-74, compared to about 33 percent in 1975-77. By the same token, however, the proportion of mediated teacher cases also declined, from 78.5 percent of impasse cases in 1972-74 to 44.5 percent in 1975-77. Therefore, it is difficult to say to what extent one can attribute the apparent decline in the effectiveness in mediation in public safety disputes to the availability of arbitration as a final step in the procedure. The proportion of successfully mediated cases might have declined even in the absence of the final-offer law because of the changing economic environment in which bargaining took place after 1974.

TABLE III.3

STAGE OF SETTLEMENT BY UNIT, BEFORE AND AFTER LAW

	FY 1972-74						FY 1975-77					
	POLICE			FIRE			POLICE			FIRE		
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
WITHDRAWN	5	4.9	2	3.7	6	3.0	14	9.3	7	6.1	71	31.3
MEDIATION	64	62.1	32	59.3	157	78.5	56	37.1	35	30.4	101	44.5
DURING FACT-FINDING	13	12.6	4	7.4	16	8.0	26	17.2	19	16.5	34	15.0
FOLLOWING FACT-FINDER'S REPORT	19	18.4	15	27.8	20	10.0	29	19.2	15	13.0	21	9.2
IN ARBITRATION	-	-	-	-	-	-	10	6.6	17	14.8	-	-
FOLLOWING ARBITRATION AWARD	-	-	-	-	-	-	16	10.6	21	18.3	-	-
REMAND TO PARTIES	-	-	-	-	-	-	-	-	1	0.9	-	-
OTHERS	2	1.9	1	1.8	1	0.5	-	-	-	-	-	-
TOTAL	103	100.0	54	100.0	200	100.0	151	100.0	115	100.0	227	100.0
PENDING	-	-	-	-	-	-	47	-	42	-	45	-

The data in Table III.3 also seem to indicate that the fact-finding process retained its vitality as a dispute settlement technique after the adoption of final-offer arbitration. About one-third of public safety impasses were settled in fact-finding before the law was passed (i.e., either through "mediated fact-finding" or after the issue of a formal report) and a slightly higher proportion of impasses were settled through fact-finding after passage of the law. Furthermore, our examination of final-offer awards suggests that in all but a small number of cases, the arbitrator selected the party's offer that came closest to (or was identical to) the fact-finder's formal recommendations. Of all the statutory criteria that the arbitrator is instructed to apply in final-offer cases, the fact-finder's report clearly appears to have been the most compelling to arbitrators.

A final indicator of the effect of final-offer arbitration on the bargaining process in police and fire cases can be obtained by an examination of the data in Table III.4, which provide the time (in months) elapsed from the declaration of impasse to the settlement of the case. It is apparent from the data that the final-offer statute has elongated the period of time that elapses from impasse to settlement. For example, the average police impasse was settled in about four months in the period 1972-74, but took five months in 1975-77. Similarly, the average fire impasse was settled in 4.7 months in the earlier period, but took 5.8 months in the post-law period. At the same time, the average length of time to settle teacher impasses decreased from 2.4 months in 1972-74 to 1.8 months in 1975-77.

The elongation of time required to settle police and fire impasses results principally from two factors: (1) cases settled in fact-finding took a longer period of time after the passage of the final-offer statute than before, and (2) cases going to arbitration, a stage obviously not available before fiscal 1975, took an average of 12 months from date of impasse to date of settlement.

Despite the fact that it takes, on the average, about a year to settle cases going to arbitration, we do not find this time to be excessive for the following reasons. First, we were not able to uncover arbitration cases in which there were unnecessary administrative delays. Second, the experience under the Massachusetts statute compares favorably with the experience under other arbitration laws.

TABLE III.4
TIME FROM IMPASSE TO SETTLEMENT (in months)

<u>FY 1972—FY 1974:</u>	<u>POLICE</u>	<u>FIREFIGHTERS</u>	<u>TEACHERS</u>
Mediation	2.7	2.0	1.7
During Fact-Finding	4.8	5.3	4.8
Following Fact-Finder's Report	7.5	6.5	5.9
Overall Mean	3.95	4.73	2.36
 <u>FY 1975—FY 1977 (Dec. 31):</u>	 <u>POLICE</u>	 <u>FIREFIGHTERS</u>	 <u>TEACHERS</u>
Mediation	1.1	1.8	1.6
During Fact-Finding	5.6	4.7	3.8
Following Fact-Finder's Report	7.6	8.5	5.8
In Arbitration	8.9	10.0	-
Following Arbitration Award	12.7	11.3	-
Overall Mean	4.91	5.78	1.82

IV. Salary Levels and Changes for Massachusetts' Police and Firefighters, 1973-77

This section presents the results of our salary survey of police and firefighter contracts. First, absolute salary levels are reported in tabular form and briefly discussed. Second, the rate of change in salary is cross-tabulated with the stage of settlement data.

Police and Fire Salary Levels:

Table IV.1 presents mean salary levels and ranges of the four maximum contractual salaries paid to the employee groups included in this study over the 5 years, 1973-77. The sample in each year for each of the cohorts is not the same since we were unable to collect the information from precisely the same cities and towns over all of the years under study. It is for this reason, for example, that the minimum level may drop from one year to the next as different contracts were included in or excluded from the sample. Since our samples are representative of all contracts in the state in any particular year, this change in the composition of the samples does not bias the estimated mean salary levels reported.

With only a few exceptions, the information collected shows a smooth progression in negotiated salary changes. The pre-arbitration law years of 1973-74 show changes similar in magnitude to the post-law years. There is no significant jump in salary levels in either 1975 or 1976. Over the period from 1973 to 1976 the firefighters, on average, were able to keep a bit ahead of the comparable police group, but in 1977 the police gained the edge in mean maximum negotiated salary. However, the reported salary ranges reveal that the highest paying firefighter units have kept an advantage over the highest paying police units for every year after 1973.

In order to provide a point a point of reference for the levels (and changes) of police and firefighter salaries in Massachusetts we have provided the reader with Table IV. 1a, which shows the average maximum police and firefighter salaries for

Table IV. 1: Mean Salary Levels and Ranges for Four Bargaining Unit Safety Employee Groups in Massachusetts, 1973-77.*

	1973	1974	1975	1976	1977
Police Patrolmen: Mean	\$9,759	\$10,174	\$10,889	\$11,781	\$12,556
Range	\$8400 - \$12,200	\$8300 - \$13,000	\$8800 - \$13,000	\$8900 - \$14,100	\$9800 - \$14,600
(Sample Size)	(54)	(101)	(122)	(118)	(73)
Police Sergeants: Mean	\$10,980	\$11,549	\$12,404	\$13,470	\$14,475
Range	\$9000 - \$14,000	\$8700 - \$14,800	\$9400 - \$15,700	\$9500 - \$16,600	\$10,600 - \$19,200
(Sample Size)	(55)	(96)	(115)	(115)	(71)
Firefighters: Mean	\$10,340	\$10,735	\$10,020	\$11,807	\$11,827
Range	\$9200 - \$11,300	\$9200 - \$14,200	\$9300 - \$14,600	\$9500 - \$14,600	\$5000 - \$15,000
(Sample Size)	(5)	(55)	(84)	(88)	(part-time) (60)
Fire Lieutenants: Mean	\$11,820	\$12,320	\$12,713	\$13,389	\$14,228
Range	\$10,600-\$13,300	\$10,300-\$15,600	\$9900-\$17,300	\$10,000-\$18,100	\$9100-\$22,200
(Sample Size)	(5)	(35)	(64)	(70)	(32)

* Note that the salary levels reported in this table are the maximum level as taken directly from the signed collective agreements. The illustrated data should not be interpreted as the average salary for all the safety employees in that group, but rather as the average of the maximum which can be earned under the contracts.

Table IV.1a

Maximum Salary Levels for Police and Firefighters
in the Northeast, 1973-1976 (Cities over 100,000 pop.)
(Source: U.S. Department of Labor, Office of Information
News Release #76-1496, December 17, 1976)

	1973	1974	1975	1976
Police Patrolmen	\$12,944	\$13,776	\$14,207	\$15,043
Firefighters	\$12,515	\$13,301	\$13,731	\$14,420

cities over 100,000 population for the northeast United States, 1973-76. The same data were not available for police sergeants and fire lieutenants, but the patrolmen and firefighter data are directly comparable to our sample. The data presented for the Northeast are biased upwards in terms of absolute salary level and are not directly comparable to our survey since they comprise only cities over 100,000 population. Larger cities have traditionally paid their safety employees higher salaries than small cities. However, the variation between the average levels in the Northeast and those found in our survey in Massachusetts are so large that even discounting the aggregate data for the Northeast by 10 percent still shown that police and fire wages in Massachusetts may be low vis-a-vis other jurisdictions in the region. In no case is the differential reported in Table IV, less than 17 percent higher than comparable Massachusetts salaries.

Awareness of the fact that they were behind salary levels paid in large cities in the Northeast could well have influenced police and fire units to make the demands they did over the period covered. One might hypothesize that the rate of change in salaries in Massachusetts would be higher than the rate for large cities in the Northeast because of the unions' efforts to "catch up" with salaries paid elsewhere in the region. This is discussed next.

Salary changes for maximum police and firefighter salaries:

This section presents the findings of our survey of police and firefighter salary changes over the period under study. Rates of change in salaries are presented in tabular form with the stage of settlement (no impasse, mediation, factfinding or arbitration) and compared across years prior to and after the passage of the Massachusetts final-offer arbitration statute. The reader should be cautioned that this information is presented only for descriptive purposes and the results cannot be couched in a cause and effect framework. Moreover, this section only addresses the issue of changes in salaries and does not include any other

contract changes, either economic (cost of living adjustment, longevity, and so on) or noneconomic (manning requirements, shift schedules, and so on). Therefore it in no way represents the total cost changes in a newly negotiated collective agreement.

Tables IV.2 and IV.2a show the rate of change in the maximum salary for police patrolmen and sergeants differentiated by year and stage of settlement. The largest mean yearly change for patrolmen shown in Table IV.2 is 10.2 percent for those police units that settled in mediation in 1975. This was the percentage change from 1975 to 1976. The lowest observed mean change is for mediated settlements in 1973. In none of the years presented is there a statistically significant difference between the patrolmen's mean salary changes and stage of settlement for the year. The salary changes shown for police sergeants in Table IV.2a follows almost the same pattern as the patrolmen data. Again, the exception is for mediated settlements in 1975 where the average gained was over 12 percent. This figure provides the only statistically significant value (testing for differences between the means) obtained in the calculations and most likely reflects the fact that the rate of inflation in 1974 was over 12 percent. Further, although the range of settlements was quite large, especially in 1974, the "outliers" obviously represent some drastic change (likely a "catchup" effect or change in the structure of maximum patrolman or sergeant salary.) Moreover, the standard deviation was in no cases higher than 6.0 percent. The standard deviation is easily understood by remembering that approximately two-thirds of the cases fall within one standard deviation on either side of the mean. In this particular presentation for, say, 1975, two-thirds of the 105 cases (i.e., 70 cases) fall within the range of 3.3 to 13.5 percent salary increases.

Comparison of the changes before and after the law was amended shows that the absolute value of the salary change increased somewhat between the pre-law years of 1973 and 1974 and the post-law years of 1975 and 1976. The causes of the increase in the level of salary changes cannot be ascertained from this table. Within years,

Table IV. 2 Percentage Increase in Salary by Stage of Settlement
(Maximum salary for patrolmen)*

Stage of Settlement	Year in which contract was negotiated			
	1973	1974	1975	1976
1. No impasse	(35) ^{**} .060	(74) .070	(67) .082	(41) .076
2. Mediation	(6) .053	(14) .073	(15) .102	(15) .072
3. Fact-Finding	(3) .080	(4) .057	(13) .068	(0) ^{***}
4. Arbitration	N.A.	N.A.	(10) .081	(0) ^{***}
Mean Salary Change	.060	.069	.084	.075
Standard Deviation	.035	.049	.051	.043
Range	.00 - .22	-.03 - .41	.00 - .22	.00 - .16
Total number in our survey	(44)	(92)	(125)	(56)

* Note that the sample includes information for only the year in which the surveyed units engaged in bargaining.

** Number in () is the cell count

*** As the table is derived from the merger of the impasse data collected from state files and the contract data collected independently, we are only able to report those changes for which we have been able to match the two sets. Thus, we report no fact-finding or final offer arbitration data with salary changes for 1976 in this portion of the report.

N.A. = Not Applicable or Not Available

Table IV. 2a Percentage Increase in Salary by Stage of Settlement
(Maximum Salary for Police Sergeants)*

Stage of Settlement	Year in which Contract Negotiated			
	1973	1974	1975	1976
1. No impasse	N.A.	(65)** .079	(62) .086	(39) .0
2. Mediation	N.A.	(15) .084	(14) .121	(15) .0
3. Fact finding	N.A.	(3) .088	(13) .059	***
4. Arbitration	N.A.	N.A.	(9) .076	***
Mean Salary Change	N.A.	.080	.087	.09
Standard Deviation	N.A.	N.A.	.060	.05
Range	N.A.	N.A.	.00 - .31	.00 - .2
Total # in Sample	N.A.	83	98	54

N.A., *, **, *** See Table IV. 2 for explanation of symbols

various stages of settlement.

Tables IV.3 and IV.3a present the same information for firefighters and fire lieutenants. Unfortunately we were unable to obtain reliable data for 1973 (representing the 1973-1974 salary change) and these are therefore not included in the table. Overall we found that the salary change for firefighters for each of the three years was about 7 percent. The largest mean percentage change (10.2 percent) associated with firefighter units that settled in fact finding in 1974. Again, we tested the difference between means for each stage of settlement within each year and found insignificant results. In 1976 the firefighters and fire lieutenants were able to gain a larger percentage increase when they did not go to impasse than did those units that went as far as fact finding, while in 1974, by contrast, fact finding produced the largest mean change. Furthermore in 1976 cases settled in mediation produced an average settlement almost one percentage point higher than cases settled in arbitration, while just the opposite was true in 1975.

Notable is the fact that the range of contract salary changes was much wider for the firefighters than it was for the police. In each of the three years there was at least a 20 percentage point spread for those contracts surveyed. The standard deviations, however, were approximately the same for fire as they were for police, again concentrating the settlements in the 2 to 13 percent range.

Overall the police and firefighters obtained approximately the same percentage salary increases in these years, regardless of the stage of settlement; this is not an unexpected finding, given the tradition of parity between police and fire salaries in the Commonwealth.

Following on the comparison in the previous section of absolute salary levels with those in large cities in the Northeast, we offer Table IV.4 which shows the rate of change in maximum salary for patrolmen and firefighters over the 1973-1975 period. Given that Massachusetts absolute salary levels were much lower than those in large cities in the Northeast we would have expected to find the percentage changes

Table IV.3

Percentage Increase in Salary by Stage of Settlement
(Maximum Salary for Firefighters)*

Stage of Settlement	1973	1974	1975	1976
1. No impasse	N.A.	(34)** .069	(33) .074	(34) .074
2. Mediation	N.A.	(2) .056	(16) .071	(7) .088
3. Fact Finding	N.A.	(3) .102	(10) .064	(3) .066
4. Arbitration	N.A.	N.A.	(13) .081	(1) .080
Mean Salary Change		.070	.073	.076
Standard Deviation		.061	.047	.045
Range		-.08 -.28	-.02 -.29	.00 -.25
Total Number in Sample		41	73	45

* and ** see notes with Table IV.2

Table IV.3a

Percentage Increase in Salary by Stage of Settlement(Maximum Salary for Fire Lieutenants)*

Stage of Settlement	Year in which contract negotiated			
	1973	1974	1975	1976
1. No impasse	N.A.	(28)** .082	(21) .075	(21) .095
2. Mediation	N.A.	(2) .053	(12) .089	(4) .031
3. Fact Finding	N.A.	(2) .096	(8) .063	(2) .057
4. Arbitration	N.A.	N.A.	(13) .082	(1) .058
Mean Salary Change	N.A.	.081	.078	.082
Standard Deviation	N.A.	.048	.049	.049
Range	N.A.	.01 - .22	.00 - .26	.00 - .25
Total Number in Sample	N.A.	32	54	28

N.A., *, ** see Table IV.2 for an explanation of symbols

Table IV.4

Percent Change in Maximum Police and Firefighter Salaries
in the Northeast, 1973-1975 (Cities over 100,000 pop.)

(Source: Same as Table IV.2a)

	1973	1974	1975
Police Patrolmen	6.4%	12.1%	5.6%
Firefighters	7.0%	11.9%	6.8%

Massachusetts exceeding those won in other sections of the Northeast. Only in 1975 however, did patrolmen exceed the average rate of change in the Northeast (8.1 vs. 5.6 percent), while in 1973 they made approximately the same gain and in 1974 were lower than the average (large cities) in the Northeast (12.1 vs. 6.9 percent). For firefighters we find the change in Massachusetts about the same as in the region as whole in 1975 (7.3 percent in Massachusetts vs. 6.8 percent), while in 1974 the Massachusetts firefighters obtained a 7 percent increase with the change being 11.9 percent for all the region.

These comparisons reveal that the catch up one might have predicted after looking at the absolute salary levels of Massachusetts safety employees vis-a-vis others in the Northeast did not occur to a significant degree.

One final comparison is worthwhile. Investigation of teachers' salaries in Massachusetts produced one piece of relevant information. In 1976 for those teachers with a bachelors degree and at the maximum level in their salary structure we found an average change of 6.4 percent--about 1 percentage point lower than that obtained by the police and firefighters. Teachers, of course, do not fall under the provisions of the final offer arbitration statute.

In sum, the above tables show that there is no statistically significant difference in the mean change in salary for police and fire units by stage of settlement within the years illustrated. The highest increases came in 1975 negotiations and probably reflective at least in part of the high inflation rate experienced that year. It should also be noted that in the manufacturing sector of the U.S. economy the average wage change in 1975 was approximately 7.6 percent--very close to that obtained by the police and fire contracts in our sample. Finally, average changes (and levels) of salary in Massachusetts are low relative to salary changes in larger cities in the Northeast region.

Neither the critics nor the proponents of the current structure of the collective bargaining law for police and firefighters would take a position that the stage of settlement was the only influence on the outcome of the bargaining process (i.e., the

The next section reports the results of an analysis that simultaneously takes into account several possible determinants of the outcomes of the process.

V. Multivariate Analysis of the Determinants of the Change in the Salary Levels of Police and Firefighters

In this section we present the results of our initial analysis of the determinants of the outcome (in terms of salary change) of the collective bargaining process for police and firefighters. We have based the structure of our analysis on both theoretical constructs in the field of labor relations as well as on findings of previous research in this area.

For those readers not familiar with the technique of multivariate regression analysis a brief explanation follows.¹ Let us suppose that we hypothesize that the salary change achieved in bargaining is related not only to the stage of settlement, but also, for example, to the ability of the city or town to pay and the salary level in the year prior to negotiations. We would like to find out the independent influence of all the factors that we are able to measure on the level of salary changes. On a first-order basis we can take each of the variables that we hypothesize will influence salary outcomes and run statistical tests to obtain numerical estimates of how the two variables are related (i.e., how they move with each other) These statistics are called simple correlation coefficients. Although useful as a first look at the relationship of different factors,

1 The final report will fully detail our model specifications and statistical results.

reliance on simple correlations can be misleading.¹ Let us assume for the moment that we hypothesize that two variables (stage of settlement and the previous salary level) will have an influence on the change in salary achieved at the bargaining table.² If we statistically estimated only the influence of the stage of settlement (ignoring previous salary level) on salary change our estimate would be biased for two reasons:

1. the stage of settlement and the previous level of salary may be related to each other (correlated); and 2. the previous salary level may have an influence on the salary change achieved in bargaining independent of the stage of settlement.³ Utilization of multivariate regression analysis is a statistical tool designed for the express purpose of eliminating these biases and offering a more valid estimate of the determinants of

1 For example consider looking at ice cream consumption and the number of crimes committed in a certain location. You will find a positive simple correlation which would, on first glance, lead one to hypothesize that there may be a relationship between ice cream consumption and the propensity to commit a crime--the direction of the relationship is, of course, uncertain. What is missing here is obviously the "intervening" variable --the summer months. Hopefully this trite example will aid the readers without background in statistics.

2 The stage of settlement and thus possibly the outcome can also be related to the "militancy" of the union leaders (or members) and/or the willingness of the mayor or appointed negotiator to offer higher wages or other benefits. We, of course, cannot quantify attitudinal or subjective aspects of the process and must therefore rely on accounting for as much of the variance in the change in salary as we are able to by using information that can be quantified.

3 The same analysis is applicable to any number of hypothesized influences on the change in salary. In our analysis we consider the independent and simultaneous influence of between 8 and 11 variables on the salary outcomes.

the variation in the "dependent" variable (change in salary level in our study).

The goal of multivariate analysis is to account for as much of the variance in the "dependent" variable (salary change) as possible with the data that can be collected for the variables hypothesized to have an influence on the changes in salary level.¹ The specification of the multiple regression equations we have utilized in this analysis follows:

$$\Delta S = f(I, E, P) \text{ where:}$$

ΔS = the percentage change in salary and

I : stage of settlement--no impasse, settled in mediation,
settled in fact finding, settled in arbitration

E : a set of economic and environmental variables--population,
the full value of assessments of the city or town, state
aid ("cherrysheet"), population change over the 1960-70
period, median income of the city or town (1970 data)

P : the salary level in the unit in the previous year

The salary level in the unit in the previous year, P, is used as an independent variable in our regressions in order to test the hypothesis that salary changes in police and fire units were affected by a "catch up" effect. That is, if towns and cities paid salaries that ranked low relative to other towns and cities in the Commonwealth, we hypothesized that negotiated

¹ Statistically the measure of the "goodness of fit" of the equation (the percentage of the variance in the dependent variable accounted for by the set of independent variables) is called the coefficient of multiple determination and is symbolically represented as "R²."

salary changes in such municipalities would be higher than salary changes in municipalities that ranked higher, other things being equal.

We have processed a series of equations for salary changes with the above specifications separately for the year prior to the implementation of the final-offer arbitration law (1974) and for the year after the law was passed (1975) for the following groups of employees:

1. police patrolmen
2. firefighters
3. police sergeants
4. firefighter lieutenants

The results of the analysis are presented in two parts. First we will examine the regression coefficients associated with the independent influence of the stage of settlement on the level of salary change. We will then report the independent influence of the "E" and "P" variables described above.

Stage of Settlement

For each city or town that negotiated in either or both of the two years covered in this portion of the analysis we assigned a value for the stage at which they achieved settlement of their negotiations. Two stages of settlement variables were entered in both the 1974-75 and 1975-76 regressions:

1. Mediation -- A variable indicating that the municipality settled either in mediation or in fact-finding before the fact-finder's report was issued. If the latter is the case, it is assumed that the fact-finder was able to achieve a mediated settlement.

2. Fact-finding -- A variable indicating that settlement was achieved in the municipality after a fact-finder's report was issued.

In addition, a third stage of settlement variable was entered in the 1975-76 regression:

3. Arbitration -- A variable indicating that the contract that went into effect in fiscal 1976 was the result of final-offer arbitration.

It should be reiterated that the salary change variable that is being associated with an arbitrated award is not the percentage increase that the arbitrator (or the parties) might have claimed was being implemented, but the actual percentage salary change as reflected in the police and fire salary schedules included in signed collective bargaining agreements in 1975 and 1976. We submit that this is the most accurate reflection of negotiated salary changes and allows us to compare arbitrated changes with changes achieved in other stages of the impasse procedures.

The "reference group" for the mediation, fact-finding, and arbitration variables is the group of cities and towns that achieved settlement without going to impasse at all. Thus, the coefficients obtained with the stage-of-settlement variables allow us to say, first, whether there was a significant difference between salary changes achieved at any stage of the impasse procedures and salary changes achieved without going to impasse and, second, what the magnitude of that difference, if significant, was.

Table V.1 dramatically illustrates that, with only three exceptions, the utilization of the impasse procedures did not have a statistically significant influence on the level of salary change for municipalities settling at any stage of the impasse procedures vis a vis those municipalities settling without the use of the procedures.

In two of the equations the table shows that the use of mediation resulted in a statistically significant and positive influence on the rate of change of salary. The change in police sergeants' salaries, for example, was 3.4 percentage points higher in mediated settlements than the change achieved in contracts settled without impasse. In addition, the change in firefighter lieutenants' salaries was 3.0 percentage points higher in mediated settlements than the change achieved in contracts settled without impasse.

In the case of one regression--for firefighter lieutenants--we found that the use of final offer arbitration had a statistically significant impact on salary changes in 1975-76. The coefficient in the table indicates that the rate of change in lieutenants' pay was 3.2 percentage points greater in arbitrated settlements than in settlements where there was no impasse. But note that this magnitude is virtually the same as that achieved by lieutenants whose contracts were settled in mediation.

Firefighter lieutenants and police sergeants, of course, generally constitute only a small proportion of the work force of public safety departments. By far the largest proportion of salaries paid by municipalities to their public safety employees goes to firefighters and patrolmen.

Table V. 1 Multiple Regression Coefficients for the Stage of Settlement
For 1974-75 and 1975-76 for Various Employee Groups.

Stage of Settlement	Salary Change 1974-75 (Pre Law)				Salary Change 1975-76 (Post Law)			
	Police Patrolmen	Police Sergeants	Fire-fighters	Fire Lieutenants	Police Patrolmen	Police Sergeants	Fire fighters	Fire Lieutenants
Mediation	N.S.	N.S.	N.S.	N.S.	N.S.	.034	N.S.	.030
Fact-finding	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Arbitration	N.A.	N.A.	N.A.	N.A.	N.S.	N.S.	N.S.	.032

S.: Regression coefficient is not significant

N.A.: Not applicable; arbitration is not a possible stage of settlement in 1974.

For these two key employee groups, our results show that final-offer arbitration had no significant impact on their salary changes in 1975-76. Indeed, we find that no stage of the impasse procedures--mediation, fact-finding, or arbitration--had a significant influence on negotiated salary changes for patrolmen and firefighters in either fiscal 1974, the pre-law period, or fiscal 1975, the post-law period.

There is one counter-argument that can be made that needs to be considered. Suppose that arbitrated salary settlements set a pattern that was copied by towns and cities that settled without impasse or in some other stage of the impasse procedures. Such a "spillover effect," if operative, might result in arbitrated settlements that were not significantly different from settlements achieved by other means--this is essentially the result we have found. Yet one could not say that arbitration had no influence on salary changes. If spillover does operate, then overall salary changes in a given year would be higher because of the availability of arbitration than they would have been if arbitration were not available.

It should be recalled, however, that average firefighter salary settlements in the first year of the final-offer law (1975-76) were 7.3 percent, compared to 7.0 percent in the year preceding the law (1974-75), a difference that is not statistically significant. In addition, while the average salary change for patrolmen increased from 6.9 percent in 1974-75 to 8.4 percent in 1975-76, it cannot be concluded that this increase was the result of the availability of arbitration. Most observers

would attribute any increase in police or fire settlements in 1975 to the extreme rate of inflation that occurred in that period both in Massachusetts and nationwide.

But there is an even more persuasive reason why arbitrated settlements probably did not set a pattern for settlements achieved short of arbitration. Recall that the average time that elapsed from the declaration of an impasse to an arbitration award was approximately 12 months. Thus, arbitration awards resulting from impasses declared in late fiscal 1974 or fiscal 1975 were, on the average, handed down one year later, in late fiscal 1975 or fiscal 1976. On the other hand, settlements in mediation and fact-finding occurred, on the average, from two to nine months after the declaration of impasse. Thus, most settlements that occurred in mediation and fact-finding occurred before most of the arbitration awards were handed down. Therefore, it was literally impossible for most arbitration awards to serve as pattern-setters for other settlements achieved short of arbitration in fiscal 1975.

The first final-offer award was handed down in the case of the Arlington firefighters on January 11, 1975, while the first police award, in the case of the Stoughton police department, was issued on March 13, 1975. By June 30, 1975, the end of the first year of the operation of the final-offer law, five awards had been made in firefighter cases and five awards had been made in police cases. It is conceivable that the awards made in these initial cases influenced settlements that were occurring in other towns and cities in the same general period. Our information

indicates that the average salary award in the first firefighter cases was 8.1 percent and the average award in the first police cases was 6.4 percent. (The police figure is affected by the award in the case of the Boston police department, which provided no salary increase, but did make improvements in various fringe items such as longevity pay, health insurance, educational incentive pay, and the shift differential.) It appears to us, however, that the awards made in these cases were not pattern-setters, but rather that the arbitrator was influenced most of all by the recommendations made by the fact-finder in the case at hand, and that the fact-finder based his recommendations primarily on what he thought were comparable settlements in other towns and cities. Thus, municipalities that settled through arbitration were not so much pattern-setters as they were pattern-followers.

It might still be argued that 1975 arbitration awards influenced salary changes in 1976-77, rather than 1975-76. We do not, at this stage, have a direct test of this hypothesis. We can only say at this point that the spillover effect (from arbitrated awards to non-arbitrated settlements) does not seem to operate in 1975-76.

Another caveat that must be added is that we can only account for salary changes in our analysis. Other provisions of the contract have not been included in the analysis thus far. It might be the case, for example, that salary changes were not significantly different in arbitrated cases, but that "fringe" benefit improvements were. It is quite possible that mediators, fact-finders, and arbitrators achieved settlements by persuading

the parties (or in the case of arbitrators, directing the parties by the selection of a final offer) to trade off salary gains in favor of improvements in nonsalary items. While we have collected data on certain contract provisions (health insurance, minimum manning requirements, educational incentive pay, longevity, vacations, and COLA provisions) for all municipalities in our survey, we have not yet tested the "trade off" hypotheses, although it will be explored in subsequent analysis.

Economic and Environmental Variables

A set of six environmental and economic variables was also used in the explanatory equations. In general this set of variables also failed to explain much of the variance in the dependent variable, percentage salary change. The six variables used were the following:

1. Median family income in the town or city in 1970
2. Population of the town or city in 1976
3. Change in population in the town or city between 1960 and 1970
4. "Full" or "true" value of the town or city's assessed property values per capita in 1976
5. State aid ("cherry receipts") as a percent of the town or city's total expenditures in 1976
6. Salary paid to appropriate employee group (firefighters, patrolmen, fire lieutenants, police sergeants) in the previous year

Briefly, we expected median family income to serve as a proxy for the town's ability to pay police and fire salary demands or as an indicator of the town's demand for police and fire services, and hence to be positively related to salary changes. We also expected population to be positively related to salary changes since we suspected that larger towns and cities would give larger pay gains. We also thought rapidly growing towns and cities would require an increasing level of police and fire services and that therefore change in population would be positively related to changes in police and fire salaries. Similarly, we expected wealthier communities--as measured by full value per capita--to have a greater ability to pay and therefore to have negotiated larger salary changes. Also, we expected that if a town was able to finance a larger proportion of its expenditures from state aid it would also be able to give higher salary gains to its police and fire employees. Finally, we used salary in previous years to test the hypothesis that a "catch-up" effect was operating in Massachusetts over the period examined. We expected larger percentage changes in salaries where the town or city ranked relatively low in the level of salaries it paid compared to other municipalities in the Commonwealth. Hence we expected a negative relation between salary change and salary level in the previous year.

It should be noted that each of these hypotheses is well-grounded in the literature on public sector wage determination, which is reviewed in the appendix to this report.

The series of six environmental and economic variables used in the explanatory equations performed poorly in explaining the variance in the level of salary change over the two-year period. In only two of the eight equations did we find a statistically significant relationship between the series of variables representing ability to pay and population. The significant variables appeared in the equations for firefighters and fire lieutenants in 1974-75. Population of the city or town was found to be positively related to salary level changes. In other words, the larger the city, the more the firefighters were able to gain in this round of negotiations, everything else held constant.¹

The second significant variable in the 1974-75 firefighter (not lieutenants) equation was one of our measures of ability to pay--the cherry sheet (state aid) number divided by population to give a state aid per capita figure. Surprisingly the coefficient was negatively related to salary change, i.e., the more state aid per capita, all else held constant, the less the firefighters were likely to gain in salary change in that year. This coefficient did not, however, show significance in the 1975-76 negotiations.²

1 It may be that this finding is related to the fact that it is more dangerous to be a firefighter in a large city and this fact enters into the willingness of city managers to pay their firemen more.

2 Interpretation of why this variable was negatively significant would be an interesting exercise for a political scientist.

Again, the researchers were somewhat surprised that the other variables included in the equations which were tried and tested measures of the city or town's "ability to pay" were not significantly related to salary changes. For example, median family income and assessed valuation of property had no influence on the salary changes in our equations. Further, population growth (a proxy for increasing demand for police and fire services in the city or town) was also insignificant in all equations.

Salary Level in Previous Year ("Catch-up" Variable)

As a measure of "catch up" which might be included in the attained salary gain we "lagged" each bargaining unit in the analysis one year. The hypothesis being that if a particular unit was significantly below the mean salary level of other police or fire jurisdictions it would influence the amount of salary change they were able to achieve in bargaining.

For the equation of firefighter lieutenants for 1975-76 this variable in fact turned out to be significant and negatively related to salary change, as expected. The obtained coefficient of $-.18$ means that for every \$100 below the previous year's mean salary level for the other firefighter lieutenants in our sample the unit was able to achieve a positive salary change of about .2 of one percent. In other words, if firefighter lieutenants in town A were paid a salary \$500 below the mean observed in other cities and towns, all else constant, they would have gained almost an additional 1 percent in salary level change.

The catch-up variable also was significant for the police sergeants' equation for the 1974-75 salary changes. The obtained coefficient of -2.7 indicates that for every \$100 "behind" the sergeants were in the preceding year, they were able to gain a positive salary change of almost .3 of one percent.

Summary

We have specified our equations designed to "explain" the variation in salary changes for the various bargaining units based on previous research in this area and in response to the questions currently being debated in the Massachusetts legislature. It should be clear to the reader that our equations did not "explain" (or account for) the observed variation in salary changes.

Only three of the eight equations were statistically significant in accounting for the variation in salary changes. And within these significant equations only one or two variables were individually significant. Although this may appear to be a mistake in specification, we do not think so. It is important that we have taken this analytically sound step in our evaluation as the fact that only a few of the variables, which by "conventional wisdom" or research on other states' experience, were hypothesized to influence heavily the salary outcomes of bargaining, according to our analysis, had little influence on the outcomes of bargaining, as measured by salary changes.

The findings point to the conclusion that impasse procedures do not, in and of themselves, either significantly increase or decrease

the salary level attained in bargaining. Again it should be stressed that we have not yet analyzed whether the other components of the negotiated contract are related to stage of settlement.

Further, our measures of the ability of a city or town to pay (full value, median family income) and the size of the city are related to salary changes in only a few sporadic and ungeneralizable cases.

One must then ask, "What are the important factors that have an influence on the salary outcomes of collective negotiations for police and firefighters?" Without further exploratory work we can only speculate on this point. Clearly the overall economic climate, the rate of inflation, and other variables in the economic environment, which we have not been able to account for, are related. Possibly most important and at the same time most difficult to measure, are the traditional levels of salaries vis a vis other public and private employees.¹ Moreover, there are certainly political considerations involved in wage determination, especially for public employees. The expanded final report of this study will explore these issues further.

¹ For example, for almost 40 years the relationship of the minimum wage to the average wage in manufacturing employment has held constant at about 50 percent. No one is able to point out why this relationship holds stable over the medium and long run.

VI. Interpretations and Conclusions

This summary concentrates attention on the impact of the current police and firefighter statute on both the process of bargaining and the salary outcomes.

The addition of final-offer arbitration to the array of impasse procedures available to police and fire units has had some clearly discernible impact on the process of bargaining. In the post-law period we have found that those units which go to impasse, take, on average, a longer time to finally reach an agreement. It may be that the parties have come to rely more on utilization of impasse procedures. The increasing percentage of units going to impasse after the law points to this conclusion. However, the fact that 1974, 1975 and 1976 were years of severe recession coupled with high inflation almost surely had an impact on both the willingness and ability of municipalities to meet union demands as well as on the pay levels demanded and the adamance with which the unions approached the negotiating process.

The latter interpretation is given some credence when looking at the level of and changes in salaries obtained by the various units over the years studied. We found an increase in the rate of salary change for firefighters in 1975, but not for police. In any case, the 7 or 8 percent negotiated increases were not extraordinary given that the rate of change in the consumer price index in 1974 was over 12 percent. Moreover, the salary changes gained in collective bargaining were close in magnitude to the average changes in both the public and private sector across the

U.S. and, when compared with police and fire changes in large cities in the Northeast, the observed Massachusetts changes are less in 1974 and a bit larger in 1975.

Comparison of police and firefighter changes in salary levels over the five years studied shows that they have maintained virtually constant relative wages, as has been historically true in the Commonwealth.

Examination of the rates of salary changes with the stage of settlement shows mixed findings for various years and employee cohorts. In only one case did we find a statistically significant difference among or between the stage of settlement and the salary change attained in negotiations. To further test this relationship we employed a statistical technique which allowed for the simultaneous consideration of a number of variables. We found only three cases where the relationship between the stage of settlement and the change in salary levels was significant (police sergeants and fire lieutenants in mediation in 1975 and fire lieutenants in arbitration in 1975) and, even here, the statistical significance was marginal and not generalizable to the other bargaining groups. We then went further to test whether the arbitrated settlements set a pattern that was then copied by the other units bargaining in the same year, who may or may not have settled without impasse. Again, our examination showed no evidence of a "spillover" effect in the same bargaining year, although we were not as yet able to test whether the "spillover" possibly has an impact on the negotiated settlements in the

year following final-offer arbitration awards. One caveat which should be pointed out is that our analysis only examined the rate of change in salary level associated with impasse procedures. It may be the case that salary changes were not significantly different in arbitrated cases, but that other fringe benefit improvements were. Although we collected some data on fringe benefits, we have not yet tested this "trade-off" hypothesis, but will do so in subsequent analyses.

We also tested to see if the environmental variables (population, median family income, full value, cherry sheet values, unemployment rate and so on) had an impact on the salary changes. In only one instance, not enough to generalize the findings, did we show a defensible relationship between population and salary change. Further, there is no relationship between the remainder of our environmental variables and the salary changes.

The measure we used to test for "catch-up" in the negotiations proved to be significantly related to salary changes in two cases (fire lieutenants in 1975 and police sergeants in 1974). This finding can be interpreted in two ways. Either the remainder of the units in the years studied were not far enough behind the mean salaries for their counterpart employee groups in the previous year or the negotiations did not result in the units' "catching up." In any case, the findings have little to do with the process of collective bargaining under study here and are not generalizable to the entire sample of bargaining units.

In the final analysis our study will not lend support to the notion that the addition of final-offer arbitration to the array of impasse procedures available to Massachusetts' police and firefighters had a positively significant effect on the salary levels they were able to achieve in negotiations. At the same time we can conclude that safety employee bargaining units within the Commonwealth have come to rely more heavily on outside parties in the settlement of their contract disputes. Whether this latter finding is the result of the availability of the impasse procedures or the difficult economic situation of the last few years is uncertain.

Appendix 2:

SUMMARY OF DATA SOURCES USED IN THE ANALYSIS

Following is a brief presentation of the sources of data utilized in the analysis with several problem areas highlighted. It should be emphasized that we made every reasonable attempt to verify that the information given to us was accurate. There is not central source of information within the state for the terms and conditions of employment for police and fire-fighters even though there is a law in the state that requires contracts to be filed with the Massachusetts Labor Relations Commission. Consequently we often had to go directly to the bargaining unit or the association representing the group. Impasse information is complete since the Massachusetts Board of Conciliation and Arbitration was fully cooperative and opened their files to us. The economic and environmental data is accurate and compiled from available published data sources. Each of three major data files created is briefly discussed.

Impasse Data

We collected information on the number of cases for all police, fire, and teacher units that went to impasse (mediation, fact finding, and, after July 1, 1974, arbitration) for the years 1972-77, from the dockets and files of the Board of Conciliation and Arbitration. The information was generally complete with the following problem areas: 1) it was difficult to trace cases that were active when the fiscal year was switched from the calendar year to one beginning July 1; 2) following cases that were active when the final offer provision was added, presented a problem since a new case numbering system was introduced. Both issues were checked thoroughly with staff members at the Board and they concurred with the decision rules we adopted.

Police and Fire Contract Data

Firefighter contract information came from: 1) files at Professional Fire Fighters of Massachusetts; 2) Massachusetts League of Cities and Towns--Fire Wage, Hour, and Fringe Benefit Survey (1974, 75, 76, and supplements); files at Massachusetts Labor Relations Commission for contract information after July 1, 1974; files at Holtz and Drachman (Boston law firm). Police contract information was collected from: 1) Massachusetts Police Association--Schedule of Compensation and Other Benefits (1972-1976); Massachusetts League of Cities and Towns--Police Wage, Hour and Fringe Benefit Survey (1974-76 and supplements); files at Massachusetts Labor Relations Commission for information after July 1, 1974; files at Holtz and Drachman (Boston law firm).

In general, information for 1975, 1976 and 1977 was available from most sources. By combining the information obtained from each source we were able to assemble a total sample that varied from year to year and by type of employee, but at the maximum numbered about 150. Information for 1973 and 1974, however, was less comprehensive.

Our major problem was trying to identify the precise contract period. By comparing different sources we were able, in most cases, to determine the year for which the contract applied. If we could not precisely determine the contract period we excluded the case.

Environment and Economic Variables

Fiscal information came from the following sources: Massachusetts taxpayers Foundation--Municipal Financial Data (1976 & 1977) and files at the Bureau of Local Taxation for 1970.

Demographic information came from 1970 Census of Population, Vol. 1, Characteristics of the Population of Massachusetts.

The only problematic data was the "full valuation" variable as the formula for computing the figure has changes somewhat since 1974. The recent figures tend to be more accurate than the equalized valuation figure computed before 1974.

HD28.M414 no.934- 77
Massachusetts /Government influence on
731540 D*BKS 00037728



3 9080 000 866 993

HD28.M414 no.935- 77
Von Hippel, Er/A customer-active parad
731542 D*BKS 00037730



3 9080 000 867 033

HD28.M414 no.936- 77
Allen, Thomas /The relation of interna
733225 D*BKS 00046638



3 9080 000 974 292

HD28.M414 no.937- 77
Holland, Danie/Trends in corporate pro
731544 D*BKS 00037729



3 9080 000 867 017

HD28.M414 no.938- 77
Driscoll, Jame/Analyzing attitudes tow
731546 D*BKS 00037731



3 9080 000 867 058

HD28.M414 no.939- 77
Allen, Thomas /The role of person to p
733231 D*BKS 00046606



3 9080 000 973 880

HD28.M414 no. 940- 77
Tomlin, Breffn/Organizational structur
733223 D*BKS 00046641



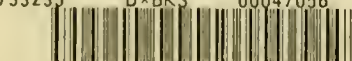
3 9080 000 974 334

HD28.M414 no.941- 77
Lipsky, David /The impact of final off
733233 D*BKS 00046605



3 9080 000 973 864

HD28.M414 no.942- 77
Allen, Thomas /Research program on the
733235 D*BKS 00047056



3 9080 000 978 970

